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A Preliminary Analysis of the Reliability
and Validity of the Leader Observation System

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) After discussing the development of a newly developing leader observation system (LOS), an assessment is made of its interrater reliability and construct validity. A multitrait multimethod analysis was used. The results indicate enough initial support of the LOS to warrant its further development and testing.		

TOWARD AN OBSERVATION SYSTEM
FOR MEASURING LEADER BEHAVIOR IN NATURAL SETTINGS

Abstract

This paper reports the analysis of a newly developing observation system for measuring leader behavior in natural settings. The development of this leadership observation system (LOS) is first described in the paper. After trained observers had logged 440 hours of free observation of 44 managers, (10 hours each over a two week period) a Delphi approach was used to derive 12 categories and accompanying behavioral descriptors. Trained participant (N = 88) and outside (N = 8) observers simultaneously, but independently, directly recorded the behavior of the target leaders on the LOS instrument every hour over a two week period. The target leaders also filled out a self estimate of time usage questionnaire that contained the same 12 categories as the LOS instrument. In addition, the target leaders, their superiors (N = 118), peers (N = 210) and subordinates (N = 362) completed the widely used LBDQ-XII and the new MBS (Yukl & Nemeroff, 1979) questionnaires. There was high interrater agreement reliability between the participant and outside observers. To go beyond this relatively simple reliability assessment, a multitrait-multimethod (MTMM) analysis was conducted. The results gave some support for the validity (both convergent and discriminant) of the LOS when multiple rater sources (participant and outside observers) were treated as more than one method. In contrast, neither of the leadership questionnaire measures (LBDQ-XII or MBS) was demonstrated to have any support for construct validity when multiple rater sources (self, superior, peers and subordinates) were treated as multiple methods. When the standardized questionnaires and leadership observation system were treated as multiple methods, the validity analysis was not very encouraging. Part of the problem, however, was that there were not directly comparable behavioral categories across these methods. When directly comparable categories from the self estimate of time usage questionnaire were compared to the LOS, the MTMM analysis yielded more support for validity. Although this study is clearly only a beginning, there seems to be enough initial support for reliability and validity to warrant further development and analysis of this observational system for measuring leader behavior in natural settings.



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Toward An Observation System for Measuring Leader Behavior in Natural Settings

At the Fifth Biennial Leadership Symposium a social learning theory base and observational measurement of leader behavior were proposed (Luthans, 1979). More specifically a call was made for: (1) getting back to observable behavior in natural settings as the unit of analysis for the study of leadership; (2) a social learning theoretical framework that recognized leadership to be a reciprocal, interactive process involving the leader (including his/her cognitions and traits), the environment (including followers and structural and other organizational and broader environmental variables), and the leader's behavior itself; and (3) alternatives to the commonly used indirect questionnaire measures of leader behavior such as an observational system.

A number of papers and book sections have since attempted to refine and expand the first two points either directly (e.g. see: Davis & Luthans, 1979; Luthans, 1981, pp. 429-432; Luthans & Davis, 1979) or indirectly (e.g. see: Davis & Luthans, 1980a, 1980b; Luthans, 1981, pp. 63-71; Luthans & Davis, 1982; Luthans, Paul & Baker, 1981). The interested reader is referred to these sources for a full treatment of the use of observable behavior as the unit of analysis and social learning as the theoretical base for the study, understanding, and research perspective for leadership.

Let it simply be said that the study described here drew from the first proposal of the earlier symposium by using observable behavior in situ as the unit of analysis and from the second proposal by using the interactive notion from social learning as the theoretical foundation. The major thrust of this paper, however, is to explore and report the efforts made on the third proposal made at the earlier symposium - the need to develop other than questionnaire measures of leader behavior such as an observation system.

Why an Observation System to Measure Leader Behavior

An observational measurement approach to leadership behavior seems desirable for two major reasons. First, if leadership is viewed as an interactional process, as in social learning theory, then as Kerlinger (1973) has pointed out, "observations must be used when the variables of research studies are interactive and interpersonal in nature" (p. 554). The second reason for the need of an observational system is the apparent inadequacies of existing questionnaire measures. There is a growing awareness and recognition that the questionnaire measures that leadership research has almost solely depended upon over the years may be a major reason for the dismal state of the field.

Schriesheim and his colleagues have recently supplied empirical evidence that casts some serious doubts as to the reliability and validity of commonly used leadership questionnaires such as the Ohio State LBDQ and Fiedler's LPC instruments (e.g., see: Schriesheim, Bannister & Money, 1979; Schriesheim & Kerr, 1974, 1977; Schriesheim, Kinnicki & Schriesheim, 1979). For example, in a comprehensive paper presented at the Fourth Biennial Leadership Symposium, Schriesheim and Kerr (1977) concluded that "leadership is today without any instruments of demonstrated validity and reliability" (p. 33). This finding does not necessarily mean that the instruments reviewed do not possess reliability and validity, but rather the available evidence simply does not support them. This has spurred a number of studies to demonstrate the psychometric properties of these instruments (see Bass, 1981 for a review of this literature) and the more careful development of new questionnaires (Yukl & Nemeroff, 1979). However, except for a few preliminary attempts (for example the last Symposium had two papers that were based on observational research, see: Bussom, Larson & Vicars, 1982; Lombardo & McCall, 1982; and this current Symposium contains an observational study of educational managers reported by

Martinko and Gardner, 1982), more direct alternative measurement techniques such as observational systems have not been developed nor used in leadership research. The purpose of this paper is to provide at least the beginnings of a possible alternative - a supplement (not a total replacement) to questionnaire measures of leader behavior. This study was undertaken to make a preliminary assessment of a newly developing leader observation system (LOS) for the measurement of leader behavior in natural settings.

Method

Settings and Subjects

The study utilized five purposely diverse organizational samples: a fairly large financial institution, a state agency, a medium sized manufacturing plant, a campus police department, and the Navy and Army R.O.T.C. units of a university. All those with supervisory responsibilities (from the president down to first line supervision) in the financial institution (N=52), campus police (N=16), and professional staff in the R.O.T.C. units (N=15) and supervisors/managers (usually within the same department) in selected operational departments of the state agency (N=18) and manufacturing plant (N=19) served as target leaders (total N=120) in the study. Thus, leaders are defined in this study as those in managerial positions (at all levels) with responsibilities for supervising two or more subordinates. These target leaders typically had been with their respective organizations 6-10 years and in their present positions 1-5 years. They were generally distributed throughout the 26-55 age range and a great majority had a college education. Their jobs covered the whole range of functions found in their respective organizations. These demographics were compatible with the intent of the study which was to generalize across levels, functions and personal characteristics of leaders.

Measures

Leadership behavior measures included in this study were the Leader Behavior Description Questionnaire--Form XII (LBDQ-XII) developed by Stogdill, Goode, and Day (1962), the Managerial Behavior Survey (MBS) developed by Yukl and Nemeroff (1979), and the newly developing Leadership Observation System (LOS).

The LBDQ-XII was used because it represents the most widely used measure in leadership behavior research to date. Many of the leadership theories and research findings to date are based on some variation of the IS (initiating structure) and C (consideration) subscales included in this questionnaire. Yet, as previously pointed out, the LBDQ-XII measure lacks convincing demonstrable support for construct validity. Previously reported reliabilities of the LBDQ-XII have been fairly favorable (Bass, 1981; Schriesheim & Kerr, 1977) and the Cronbach alphas in the present study (N=393) ranged from .74 to .91 for the various subscales. The IS scale was .86 and the C scale was .83.

Although a relatively new and still developing instrument, the MBS was used because, in the words of the authors Yukl and Nemeroff (1979), it was specifically designed to "identify distinct, meaningful, and widely applicable categories of leadership behavior" (p. 169). Thus, it attempts to tap multiple behaviors. In addition, the reported psychometric properties of the MBS reported by its authors is quite favorable. In four separate studies the Cronbach alphas are reported in the .7 and .8 range (Yukl & Nemeroff, 1979) and in the present study (N=395) they ranged from .56 to .90 on the various subscales.

The Leader Observation System (LOS)

The Observation System used in this study was developed in two major phases. First, 44 leaders (defined as those in managerial positions with

supervisory responsibilities) at all levels in all types of organizations (not the 120 target leaders who were the subjects of the actual study) were observed in a completely unstructured format for a varied hour each day over a two week period of time (i.e. 440 hours of unstructured observation of leaders in their natural settings). The 44 observers were management students who were given an extensive training workshop. This observer training emphasized the systematic errors commonly found in observing others (i.e. it followed the procedures suggested by Thornton & Zorich, 1980). In addition, they practiced writing protocols from several role playing exercises that were then critiqued by the trainers/researchers. The observers were trained to continuously observe the behavior of the target leader over the hour; to record specific, identifiable behaviors on their logs; and to be reporters concentrating on objective description rather than trying to judge or evaluate the behaviors observed. These observers had not yet studied leadership theory or research, thus the attempt was made to minimize the possible confounding effect that implicit theories may have on observing leader behavior (DeNisi & Schriesheim, 1981).

While true randomization of the observation times was not possible, the observers systematically varied their hours throughout each working day during the two weeks to help assure representativeness. After the two weeks, the observed leaders were shown copies of the protocols of their behaviors and were asked to rate to what extent these were typical of their behavior. On a scale of 1-5, the mean rating was 3.9, which indicated the behaviors, on the average, were typical "to a considerable extent." These leaders were also asked to suggest any additional behaviors which they considered typical. These additions mainly consisted of activities which might be best described as of a sensitive nature, i.e., important policy meetings, disciplining, and managing conflict.

The second major phase involved in deriving the LOS used in this study was the considerable job of constructing comprehensive and workable categories to accommodate (contain) the 440 hours of freely observed behaviors. This task was accomplished by a Delphi process (Delbecq, VandeVen, & Gustafson, 1975). The Delphi panel consisted of four persons with considerable academic work in management/leadership and three graduate students from outside disciplines who were completely naive with respect to prior leadership research. All panel members were given handouts and required to read and become familiar with the processes of constructing adequate behavioral categories as outlined by Kerlinger (1973) and Crano and Brewer (1973).

In the first Delphi round, the panelists independently reviewed the extensive protocols completed by the observers and suggested general categories with accompanying behavioral descriptors from the protocols. The panelists were instructed to use frequency of behaviors as a guideline in constructing the categories. These categories with accompanying comments were collected (there were about 100 categories resulting from the first round) and fed back to the panelists. Then through several iterations the panelists further collapsed the categories into smaller but more comprehensive sets which could be readily used by observers to record the frequency of occurrence. Through this Delphi process, the final surviving 12 categories incorporated a multiplicity of opinions and critiques whose purpose was not only to be representative but also to be as exhaustive and mutually exclusive as possible. The resulting 12 final categories and the accompanying behavioral descriptors on the LOS instrument are shown in Figure 1.

Insert Figure 1 About Here

The categories in the LOS are conceptually similar to those associated with a managerial activities approach. Both the LOS and a managerial activities approach attempt to determine what managers/leaders actually do in the natural setting and use direct methods of measurement. However, the traditional behavioral approaches to leadership (e.g. the Ohio State or Michigan studies) depend on indirect questionnaire measures and the categories for these measures were not derived from free observation of leaders in natural settings. Instead, the researchers themselves largely determined the response sets of their questionnaires and the resulting behavioral categories are quite different (i.e. usually less concrete) from the LOS categories. Yukl and Nemeroff's MBS instrument, on the other hand, does contain many similar categories. Although drawn from the literature rather than free observation in natural settings, they did make a conscious effort to select observable, concrete behavioral categories (Yukl & Nemeroff, 1979).

Mintzberg (1973, 1975) is most closely associated with the managerial activities approach, but the "leader" is only one of his ten managerial roles. He states that, "leadership involves interpersonal relationships between the leader and the led," (1973, p. 60). As such, the manager must engage in activities which provide guidance to subordinates, motivate them, and create favorable conditions for the work. Some of these managerial activities may be classified as primarily concerned with leadership (an example would be staffing which involves hiring, training, evaluating, renumeration, promoting, and dismissing subordinates). Mintzberg, however, makes it clear that leadership permeates all managerial activities, even those with some other basic purpose. When a manager requests information from a subordinate, for example, he or she may be simultaneously motivating, training, allowing participation in decision-making, and/or monitoring the subordinate's perform-

ance. Consequently, it appears to be difficult to separate "leadership behavior", per se, from the larger domain of managerial activities and the LOS reflects this difficulty.

Results from Mintzberg-type studies (e.g. see: Kurke & Aldrich, 1979) using different organizations and subjects tend to confirm his findings. In general, these studies suggest that subordinates consume about one-half of managers' contact time and the purpose of these contacts usually involved requests, sending or receiving information, and occasionally strategy-making. These studies, however, report encountering some difficulties in coding "purpose of activities" largely because of the ambiguous or overlapping nature of the categories. In other words, the coding of activity purpose often requires a great deal of inference on the part of the observer to discriminate between, for example, overt and covert purposes, sequential purposes, multi-purposes, and changed purposes (Mintzberg, 1973, pp. 274-276). The LOS tries to overcome this coding problem by only dealing with frequencies of observable behavior and does not require inference on the part of the observer.

The actual format of the LOS instrument used in the present study lists the behavioral categories along the left hand side and random times along the top. The random times were for 10 minutes every hour over two weeks or a total of 80 observations. There was a separate sheet for each day. A nominal measuring format was used; i.e. the observers recorded either the behavior was present (" / ") or absent ("0") for each 10 minute time slot. By judging whether the behavior was present or absent the problem of inferring covert purposes of the behavior or degrees or magnitude of the behavior was avoided. Only a frequency count of the behavior was recorded by the LOS in this study.

Observers Used in the Study

Participant observers (N=88) in the study were selected jointly by the researchers and the personnel managers of the respective organizations (or the designated project officers in the case of the campus police and R.O.T.C. units) according to the following criterion: Does this person have maximum visual and audible contact with the target leader and have a good understanding of the functions, terminology, and nature of the work performed by the target leader. The target leader's informed consent was also needed and secured in all cases.

The selected participant observers in almost all cases turned out to be the target leader's secretary or a key subordinate. Eleven (12%) of the participant observers were responsible for observing two target leaders and 7 (8%) of the participant observers had three target leaders. This was discouraged as much as possible and only occurred when in the opinion of the researchers/personnel managers it was better to meet the criterion of selection as a participant observer in the study and observe more than one target leader than select another observer but not meet the selection criterion nearly as well. This usually was the case where one secretary served more than one target leader. These participant observers had considerable job experience but little formal higher education and had little or no knowledge of the literature on leadership research or theory, thus minimizing the implicit theory problem (DeNisi & Schriesheim, 1981). Except for the training they received (which will be described next), they had little or no knowledge of the specifics of the study.

The outside observers (N=8) used in the study were graduate students in management. Three were assigned to the financial institution, two to the manufacturing plant, and one to the state agency and one to the campus police

and R.O.T.C. units. An experienced graduate student (a Ph.D. student with the most knowledge of the study) observed at all the sites and largely coordinated the efforts of the other 7 outside observers. These outsider observers had briefly studied leadership theory and research in their course work in management, received training which will be described next and had a very general idea of the objectives and procedures of the study.

Observer Training

A training workshop conducted by the researchers was held on the premises of each of the participant observers' respective organizations. Each session followed the same format, used the same trainers (the authors of this paper plus a graduate assistant) and took approximately 2 1/2 hours to complete.

About the first half of the observer training workshop was devoted to three areas: First, to provide a very general explanation of the purpose of the observations (i.e. to gather data for input into a profile of the leader's behavior); second, to go over in detail the observational instrument, giving special attention and analysis to the 12 behavioral categories and the procedures for filling out the instrument including what to do if the leader was absent; and third, to give careful instruction on potential observational errors (following Thornton & Zorich, 1980) and how to overcome them. In particular, the potential errors of description versus evaluation and distortion to please the person being observed were deemed to be particularly relevant to these participant observers and were stressed in the training. For example, the observers were instructed to avoid letting their evaluative biases color their observations, since there are no "good" or "bad" categories on the instrument, the observations would be useful only if they were accurate. By careful explanation and example the trainers showed how the observers could avoid these errors.

The second half of the training was devoted to demonstration and practice. The trainers employed a number of role-playing skits which illustrated the specific leader behavior categories, and the trainees used the instrument to record the behaviors they observed. By following the principles of modeling theory (Bandura, 1977; Latham & Sari, 1979) this aspect of the training was intended to increase observer accuracy through modeling, rehearsal, and repetition. After each role-playing skit, the trainers went over the LOS instrument with the trainees and discussed which behavior category was being illustrated and which specific errors might have been committed during that observation.

In a final role-playing skit, which was rather lengthy and elaborate but realistic, 6 behavioral categories were represented. The observers performance on this last exercise served as an evaluation check for the training. A precise evaluation of observer accuracy is possible, of course, only when there is an objective criterion, i.e., when the "correct" observations are known. Such an objective criterion was possible in this training exercise because the skit was designed to exhibit the 6 categories and thus an evaluation of trainee accuracy could be made. Although this data were unavailable in one of the organizations, in the remaining four organizations the participant observer trainees had an overall mean accuracy of 92.5%, with no significant differences between organizations. This accuracy was considerably higher than the 69% obtained by Thornton and Zorich (1980) in their observer training group, but their exercise was longer.

The outside observers used in the study were given the same training as the inside, participant observers. After the training, they were given a tour of the facility and were introduced and chatted with the participant observers they would be working with over the two week observation period.

Data Collection Procedures

Approximately four weeks prior to the collection of the LOS data, all target managers (N=120) completed, among other instruments, the MBS and LBDQ-XII. The wording on these instruments were changed to reflect a self assessment. They were completed on site in the respective organizations under the supervision and instructions of the researchers. The four week time lag between the questionnaire data collection and the observational data collection was used in order to minimize contamination effects. The target leaders were also asked to fill out a brief questionnaire that asked them to give a self-estimate of the percentage of their work time spent in each of the LOS categories.

Each target leader then distributed the LBDQ-XII and MBS questionnaires to their immediate superior (N=118), usually two peers (N=210), and about three subordinates (N=362). The pro-nouns and instructions were modified in each of these samples to reflect who was filling it out. If a target manager directly supervised a large number of subordinates the researchers randomly selected out a sample of three to five subordinates to fill out the questionnaires. It was stressed the anonymity of these raters would be preserved and their names never appeared with the data.

The LOS data was then collected on the target leaders 80 times by the participant observer over a two week period of time (a random 10 minute period each working hour over two weeks). This represented a total of 9600 (120 target managers X 80 observation periods) possible observation periods when the LOS instrument was filled out. In addition, all participant observers completed a short follow-up questionnaire at the conclusion of their two-week observational period. The purpose of this questionnaire was to assess the extent to which observed behaviors were representative or "typical" of normal

behavior patterns exhibited by the target leaders over the time they have worked with them. That is, the leaders may have attempted to act in exemplary ways not necessarily customary to their typical behavior patterns simply because of the knowledge that they were being observed or this two week period may not have been representative of their typical work load. Results for this Representativeness Scale indicated that all observed behavior categories on the LOS, on average, were reported to be typical to a considerable or very great extent.

Since it was not feasible to have the outside observers present at all times during the observation data collection periods, a time sampling technique was employed to gather their data. The trained outside observer would randomly appear unannounced and simultaneously with the participant observers, but independently, record on the LOS sheets the observed behaviors of the target leader. A total of 253 such simultaneous, independent observations took place. Each of the participant observers had two or three times when an outside observer joined them unannounced to simultaneously record the behavior of the target leader.

A summary of procedures, in order of sequence, is the following:

1. LBDQ-XII and MBS questionnaire administration to target leaders (N=120) and other rater sources (superior (N=118), peers (N=120, and subordinates (N=362)) and target leader questionnaire on self estimate of time use
2. Observer training
3. Measurement of target leaders' behavior using the LOS instrument filled out by participant observers every 10 minutes for two weeks and periodically by outside observers

Reliability and Validity

The development of any new measurement system must address the important psychometric issues of reliability and validity. Unless the measurement scheme can be demonstrated to be dependable, consistent and accurate, i.e. reliable, there is always the possibility that the data gathered by the instrument are loaded with error and the results are meaningless. To the extent which measurement error is demonstrated to be slight or minimal, the measure is said to be reliable (Nunnally, 1978). The most common way to assess the reliability of behavioral data gathered by observation has been through interrater agreement (Bijou, Peterson & Ault, 1968).

Interrater reliability analysis for the LOS is quite encouraging (see Luthans, Lockwood & Conti, 1981 for a complete discussion and a full data presentation of the interrater reliability assessment). There is 93.5 percent agreement between the participant observers and the outside observers in this study. When only agreement on observed behaviors (leaving out agreement on behavioral categories that did not occur) is calculated, there is 87.4 interrater reliability. Although reliabilities are not even reported in but a couple of observational studies involving managerial leadership (Busson et.al., 1981), in order to rule out the possibility of chance agreement, statistical analysis was also performed on the interrater data gathered by the LOS instrument. Chi square calculations yielded highly significant values ($p < .001$) ranging from $X^2 = 99.3$ for "staffing" to $X^2 = 119.3$ for "Monitoring/Controlling Performance" and the r_ϕ statistics (Cohen & Cohen, 1975) had highly significant values ($p < .001$) ranging from .89 for "Staffing" to .68 for "Monitoring/Controlling Performance." Perhaps the most revealing statistic, however, is Cohen's (1960) kappa statistic which specifically represents the proportion of joint judgments in which there is agreement,

after chance agreement is excluded. The values for this kappa statistic are very similar to those for r_ϕ and the overall was a highly significant ($p < .001$) .81.

The interrater agreement assessment makes a contribution to the reliability of the LOS. However, more and different analysis is also needed. In addition, more important validity analysis is needed. Reliability, of course, is a necessary but not sufficient condition for validity. A measurement scheme may be consistently and accurately measuring something other than the intended construct. Validity basically refers to whether the measurement system is measuring what it is supposed to measure (in this case does the LOS really measure leader behavior). This simple definition does not intend to imply that validity can be demonstrated by a single study. Compared to reliability, validity is much more difficult to demonstrate.

This study uses the multitrait-multimethod (or simply MTMM) approach to extend the relatively simple interrater agreement assessment of reliability and helps begin the evaluation of validity. Cascio points out that the MTMM analysis contributes to both reliability and validity assessment. He states:

"reliability is estimated by two measures of the same trait using the same method, while validity is defined as the extent of agreement between two measures of the same trait using different methods. Thus, the distinction between reliability and validity is simply a matter of degree—that is, in terms of the similarity of measurement methods" (1978, p. 97).

Besides helping to assess both reliability and validity, the MTMM focused on construct rather than predictive validity. The evaluation of construct validity seems relatively more important at this early stage of development of the LOS. As Guion points out, "All validity is at its base some form of

construct validity. . . The most salient of the traditionally identified aspects of validity--the only one that is salient--is construct validity. It is the basic meaning of validity" (1977, p. 410). Eventually, if subsequent studies can build support for construct validity, then predictive validity will become more important. Once again, however, it must be remembered that this study is only a beginning. Reliability, and, to a greater extent validity assessment, is both a logical and an empirical process. The goal over time is to build a type of nomological network to assess the LOS and leadership in general. In this network, observable leader behaviors would be related to other observables, observables to theoretical constructs, and one theoretical construct to another theoretical construct. Only a portion of this long term goal is realized in this present study.

Results of the MTMM Analysis

The MTMM analysis in this study mainly depended on multiple rater sources as measurement by more than one method. Some may argue that such a multirater comparison makes more of a reliability than validity assessment. As used in this study, this approach hopefully contributes to both reliability and validity assessment. There are important precedents where multiple raters were used in analyzing construct validity. For example, as Lawler (1967) carefully noted:

Campbell and Fiske (1959) consider the multitrait-multimethod approach rather than the multitrait-multirater approach; however, they point out that use of raters that occupy different organizational positions relative to the ratee can reasonably be considered to be measurement by more than one method (p. 372).

In addition, it is important to point out that one of the examples used in the

original Campbell and Fiske (1959, p. 96) paper uses multiraters in the MTMM matrix. Thus, multiraters are first treated as multimethods in the MTMM analyses made of the LBDQ, MBS and LOS. This is then followed by an MTMM analysis that uses observation and questionnaire methods as multimethods. The problem with the latter approach, however, is that there are not directly comparable categories of behavior across the methods.

MTMM Analysis of the LBDQ-XII

A correlation matrix for the LBDQ-XII was constructed. Correlation coefficients between different rater sources were calculated using the Pearson Product Moment formula. In general, the matrix revealed that different rater sources (subordinate, superior, peer, and self) did not tend to agree highly enough (on the validity diagonals) to argue that convergent validity existed to any great extent. One possible exception was between superior and self ratings where six of the twelve correlations were slightly significant in the .20's range, but not enough to provide strong support for convergent validity between these two rater sources. In addition, the results did not support discriminant validity among the behavioral categories on the LBDQ-XII.

Kavanaugh, MacKinney and Wolins (1971) provide a simplified and interpretable technique for quantitatively analyzing and summarizing large MTMM matrices. In addition, this statistical analysis is less subject to judgemental interpretation. In essence, their analysis of variance model allows one to assess the relative strength (weight) of variance components attributable to convergent and discriminant validity, method or source bias (halo), and error. Table 1A presents the results of variance component and indexed calculations for the LBDQ-XII multirater matrix. It can be seen that a modest amount of the indexed variance (.20) can be attributed to rater source bias (i.e., "halo" in the rating situation). An approximately equal

proportion of the variance (.19) can be attributed to convergent validity among multiple rater sources using the LBDQ-XII instrument. Finally, almost none (.01) of the variance is attributable to discriminant validity (i.e., the subscales of the LBDQ-XII are highly intercorrelated). In summary, this statistical analysis does not provide strong support for either convergent nor discriminant validity (when compared to halo and error terms) among multiple rater sources using the LBDQ-XII instrument.

 Insert Table 1 About Here

MTMM Analysis of the MBS

The correlation matrix for the MBS questionnaire showed a pattern of results quite similar to those produced for the LBDQ-XII instrument. The results indicated that different rater sources do not tend to agree highly enough (on the validity diagonals) to argue that convergent validity existed to any great extent. Also similar to the LBDQ-XII, the results for the MBS did not appear to satisfy the requirements for discriminant validity among the behavioral categories.

The results of the statistical analysis for the MBS shown in Table 1B indicates that a moderate amount of the indexed variance (.29) can be attributed to rater source bias (halo). Less of the variance is attributable to convergent validity (.21), and almost none (.01) to discriminant validity. In summary, these results do not provide strong support for either convergent or discriminant validity (when compared to halo and error terms) among multiple rater sources using the MBS instrument.

MTMM Analysis of the LOS

The correlation matrix for the MTMM analysis of the LOS are presented in Table 2. Correlation coefficients (calculations used the Spearman Rho because of the nominal data) between participant and outside observers tend to agree substantially enough (see the validity diagonal) to argue that convergent validity exists to a moderate degree, with the possible exception of the infrequently occurring "Managing Conflict" behavioral category. With respect to discriminant validity criteria, the results are also moderately positive. That is, the pattern of correlation coefficients in the validity diagonal is generally greater than the correlation coefficients found in the two adjacent heterobehavior blocks (dotted triangles), with the exception of "Managing Conflict." The pattern of correlation coefficients in the validity diagonal is also greater than the correlation coefficients found in the monomethod-heterobehavior blocks (solid triangles). Finally, the same pattern of behavior intercorrelations are found in all of the heterobehavior triangles of both the monomethod and heteromethod blocks, even though there are some differences in the general level of correlations involved.

 Insert Table 2 About Here

Results for the statistical analysis of the LOS matrix are provided in Table 1C. It can be seen from this table that a substantial proportion of the indexed variance is attributable to discriminant validity (.68), somewhat less to convergent validity (.42), and almost none (.01) to halo bias. In total, the evidence for convergent and discriminant validity appears to be relatively strong for the LOS when multiple rater sources are considered measurement by more than one method. Once again, however, a word of caution is in order. One could question whether the participant and outside observers really repre-

sent multiple methods in a validity analysis of the LOS. They are certainly different sources and different sources have traditionally been used as different methods, but there are obviously some problems with making this strictly a validity test. On the other hand, validity assessment is judgemental and this analysis is beginning input into such a judgemental process. In addition, however, this MTMM analysis of the LOS does provide empirical input for an alternative assessment to the interrater evaluation of reliability of the LOS.

The LOS and Questionnaires as Multiple Methods

To get around the potential problems associated with the use of multiple sources as multiple methods, an attempt was made to compare similar categories of the LOS (observation method) and LBDQ-XII and MBS (questionnaire methods). This, of course, represents a classic multiple methods analysis. However, because there are widely different behavioral categories for each instrument, a way of collapsing categories for comparison purposes was needed.

The data for the LBDQ-XII and MBS were first submitted to a principal components factor analysis with varimax rotation in order to reduce the individual categories to factors which could be reasonably compared. The factor analysis for the LBDQ-XII resulted in a two factor solution (Consideration and Initiation of Structure), accounting for 64 percent of the cumulative variance. The factor analysis for the MBS resulted in a three factor solution (Consideration, Initiation of Structure, and Conflict Management), accounting for 58 percent of the variance. However, since the third factor (Conflict Management) contributed only .06 percent to the cumulative proportion of explained variance, the data were subsequently forced into a two factor solution (Consideration and Initiation of Structure) for comparison purposes. A factor analysis for the LOS was not possible because the observers were in-

structured to check as many behaviors as occurred within a given ten minute time period. Since more than one behavior was often observed during this time frame, there would be high intercorrelations among LOS categories and thus trying to determine a factor structure would be meaningless. As a result, for comparison purposes the LOS categories were forced on a conceptual basis into Consideration and Initiation of Structure factors like to the results from the LBDQ-XII and MBS factor analyses. Figure 2 shows how the behavioral categories for each instrument were collapsed into Consideration and Initiation of Structure.

 Insert Figure 2 About Here

The MTMM correlation matrix for this multiple methods analysis is presented in Table 3. Several different combinations of behavioral categories collapsed into Consideration and Initiation of Structure were also analyzed with results quite similar to those found in Table 3. It can be seen from that with the possible exception of the modest degree of convergence between the LOS and MBS Consideration factor, there is little evidence of convergence in the validity diagonals between the LOS observational method and either of the LBDQ-XII or MBS questionnaire methods. There is, however, a substantial amount of convergence in the validity diagonal between the LBDQ-XII and MBS-- both of which are questionnaire-based methods. None of the criteria for discriminant validity were satisfied to any great extent.

 Insert Table 3 About Here

The results of the statistical analysis of the MTMM matrix is shown in Table 1D. It can be seen that a substantial proportion of the indexed variance (.54) is attributable to convergent validity (for the most part between

the two questionnaire methods). A substantial proportion (.55) of the variance, however, is also attributed to halo bias in the rating situation (i.e., high scale intercorrelations between C and IS for each instrument). Finally, there was only a very modest amount of variance contributed by discriminant validity (.10). In summary, these results provide only minor support for the construct validity of any of the three leadership behavior measures analyzed by the MTMM.

To make a more directly comparable multiple methods analysis, the LOS and the self-report percentage of time usage questionnaire containing the same behavioral categories were used as two different methods. Table 4 shows that in the validity diagonal there was significant convergence between methods (the LOS and the self-report time usage questionnaire) for six of the twelve categories with three more approaching (.17) significance. There was, however, little evidence of convergence for the categories of "Decision Making/Problem Solving," "Disciplining/Punishing," and "Exchanging Routine Information." It is also interesting to note that there was greater convergence between the self estimate of time usage and participant observers (who in nearly all instances were the subordinates of target managers) than in self-subordinate comparisons for either the LBDQ-XII or MBS questionnaire measures. None of the criteria for discriminant validity seemed to be satisfied to any great extent.

 Insert Table 4 About Here

The statistical results shown in Table 1E indicates that a moderate amount of the indexed variance was attributable to both convergent validity (.31) and halo bias (.33), with the remaining proportion (.15) due to discriminant validity. In summary, these results provide moderate support for

convergent validity, but less for the discriminant validity of LOS when the multiple methods are considered to be the observation system (LOS) and a directly comparable self estimate of time usage questionnaire.

Discussion

This study provides data to begin to analyze the reliability and validity of a newly developing observation system to measure leader behavior in natural settings. Simple interrater agreement reliability was found to be quite high, but more analysis was provided. In particular, the multitrait-multimethod (MTMM) technique was used. Although there are certain limitations with the MTMM approach, [e.g. Kalleborg and Klugel (1975) have shown that the building block correlations of the MTMM matrix are all complexly determined, and, therefore, the comparisons involved in the MTMM criteria will also be complexly determined] it was deemed to provide the most appropriate and comprehensive analysis of the LOS as is possible at this point of its development.

In general, the results of the MTMM analysis indicates that when multiple rater sources (self, superior, peer, and subordinate) were considered measurement by more than one method (as widely cited MTMM analyses have done in the past, e.g., Campbell & Fiske, 1959 and Lawler, 1967), the questionnaire-based LBDQ-XII and MBS measures were not demonstrated to have support for either convergent or discriminant validity. Instead, a rather substantial within-rater source halo bias existed. Raters using these questionnaire methods generally failed to discriminate among presumably independent categories. That is, a given source tended to rate the leader on all behavioral categories in much the same manner (as evidenced by high scale intercorrelations within rater source). In addition, there was little agreement (convergence) in the

ratings of the leader among different rater sources. Each rater source apparently perceived the leader's behavior quite differently. This finding has important implications for the evaluation of the validity of these questionnaires and for analyzing the situational determinants of leader behavior.

With respect to the LOS, results of the MTMM analysis indicated at least moderate support for both convergent and discriminant validity when participant observers (generally subordinates) and outside observers were considered measurement by more than one method. In other words, participant and outside observers tended to agree when describing the behavior of a leader and tended to discriminate among behavioral categories.

Compared to the questionnaire methods, the LOS fared better in this analysis using multiple sources as multiple methods. Although the rater sources were somewhat different and more comprehensive for the questionnaire measures, the comparison shows that the LOS indices for both convergent and discriminant validities are greater and the halo problem less. This result, of course, is not convincing evidence, nor is there any intent to prove, that the observation system is superior to the questionnaire methods. It must be remembered that the LOS data are based on a fixed ten minute observation period that is common to both rater sources. The LBDQ and MBS, on the other hand, are based on an open ended and unspecified period of time. Another problem in making direct comparisons is that both rater sources in the LOS are watching the same target leader at the same time while the LBDQ and MBS draw from pooled data representing the average leadership style (ALS) of the target leaders. Despite these and other potential problems with making direct comparisons in this study, the results can serve as a stimulus and point of departure to examine and interpret some of the problems that questionnaires may have relative to observational methods and help justify the effort for developing an observational system to supplement questionnaire measures.

For example, one interpretation from these comparative results would be that the leadership questionnaire measures may be susceptible to high degrees of selective recall and halo bias on the part of the raters. On the other hand, an observational system such as the LOS may be less susceptible to selective recall (i.e., the lag between observation and recorded behavior is more immediate than in questionnaires). In addition, halo bias may be minimized when well-trained participant and outside observers are used to gather leader behavior data. For these reasons alone, continued efforts toward the development and use of observational methods for measuring leader behavior seem justified.

The results from this study would also seem to indicate that any one rater source using questionnaire measures would not provide an adequate assessment of leader behavior. The typical practice of correlating subordinate questionnaire measures of leader behavior with performance ratings of leaders based on perceptions by superiors may be like comparing apples and oranges. This study clearly indicates that various rater sources filling out a questionnaire perceive the behavior of a leader quite differently. An "appropriate" rater source would seem to depend more on the criterion measure of interest. For example, if the criterion measure of interest is performance ratings by superiors, then perhaps the appropriate rater source to describe the ratee's behavior is the superior. If subordinate satisfaction is the criterion measure of interest, then perhaps the appropriate rater source is subordinate perceptions of leader behavior, and so on. This approach, however, would also run the risk that any significant results may be due to common source (rater) variance unless there was a considerable time lag between the administration of the measures.

When the MTMM analysis used the LOS (observations) and MBS and LBDQ (questionnaires) as multiple methods, the results were less encouraging for the LOS than when multiple rater sources were used as multiple methods. When Consideration and Initiation of Structure types of factors for the LOS, LBDQ-XII, and MBS instruments were compared, results indicated: (1) a modest degree of convergence between the LOS and MBS Consideration factor, but not for Initiation of Structure; (2) no significant convergence between the LOS and LBDQ-XII for either factor; and (3) a substantial degree of convergence between the MBS and LBDQ-XII for both factors. The latter result could be attributed to a methodological artifact (i.e., both MBS and LBDQ-XII are questionnaire methods). The evidence to support the discriminant validity of any of these instruments was very slight in this portion of the analysis. It must be remembered, however, that especially in the case of the LOS, there were not directly comparable behavioral categories with the other methods. When an analysis was made with two different methods (the LOS and the Self Estimate of Time Use Questionnaire) containing the same behavioral categories, then the LOS did faire better. A moderate degree of convergent validity was evidenced, but less support was shown for discriminant validity.

Conclusions

It should be emphasized once again that this study only provide a beginning for analyzing a newly developing observation system of measuring leader behavior in natural settings. There is no intention that the results from this study can be construed as conclusive. Rather, the importance of this study lies in demonstrating the potential reliability and validity of a supplemental method to questionnaires for measuring leader behavior in natural settings. The high interrater agreement percentage contributes to the evaluation of the reliability of the LOS approach and the MTMM analysis, especially when multiple rater sources are considered to be multiple methods, contributes to its reliability and validity evaluation. The MTMM analysis using observation and questionnaires as multiple methods was not as encouraging. However, without directly comparable behavioral categories across the methods, these results may not be surprising. When the questionnaire method did use directly comparable categories (the Self Estimate of Time Usage), the results of the validity analysis were more encouraging.

An obvious need for future study would be to make a comparison between questionnaire and observation methods that have directly comparable categories. If there is demonstrated support for the validity of the widely used LBDQ or the new MBS, then the more practical and easy to use questionnaire method should be used as an important, but not only, data gathering technique for leadership research and application techniques. The same is true of the observation system. By using both questionnaires and observational techniques, a network of concordance among multiple methods of measurement can result. Such a multiple methods approach seems to be the most feasible way of obtaining a reliable and valid measure of extremely complex leader behavior. As Nunnally points out: "validity usually is a matter of degree rather than an

all-or-none property, and validation is an unending process. . . New evidence may suggest modifications of an existing measure or the development of a new and better approach to measuring the attribute in question" (1978, p. 87). This study represents but one step in this continuing effort to obtain reliable and valid measures of leader behavior.

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Figure 1
The LOS Categories and Behavioral Descriptors

1. **PLANNING/COORDINATING**
 - a. setting goals & objectives
 - b. defining tasks needed to accomplish goals
 - c. scheduling employees, timetables
 - d. assigning tasks and providing routine instructions
 - e. coordinating activities of different subs to keep work running smoothly
 - f. organizing the work
2. **STAFFING**
 - a. developing job descriptions for position openings
 - b. review applications
 - c. interview applicants
 - d. hiring
 - e. contacting applicants to inform them of being hired or not
 - f. "filling in" where needed
3. **TRAINING/DEVELOPING**
 - a. orienting employees, arranging for training seminars, etc.
 - b. clarifying roles, duties, job descriptions
 - c. coaching, mentoring, walking subordinates through task
 - d. helping subordinate with personal development plans
4. **DECISION MAKING/PROBLEM SOLVING**
 - a. defining problems
 - b. choosing between 2 or more alternatives or strategies
 - c. handling day-to-day operational crises as they arise
 - d. weigh the trade-offs; cost benefit analyses
 - e. actually deciding what to do
 - f. developing new procedures to increase efficiency
5. **PROCESSING PAPERWORK**
 - a. processing mail
 - b. reading reports, in-box
 - c. writing reports, memos, letters, etc.
 - d. routine financial reporting and bookkeeping
 - e. general desk work
6. **EXCHANGING ROUTINE INFORMATION**
 - a. answering routine procedural questions
 - b. receiving and disseminating requested information
 - c. conveying results of meetings
 - d. giving or receiving routine information over the phone
 - e. staff meetings of an informational nature (e.g., status updates, new company policies, etc.)
7. **MONITORING/CONTROLLING PERFORMANCE**
 - a. inspecting work
 - b. walking around and checking things out, touring
 - c. monitoring performance data (e.g., computer printouts, production, financial reports)
 - d. preventative maintenance
8. **MOTIVATING/REINFORCING**
 - a. allocating formal organizational rewards
 - b. asking for input, participation
 - c. conveying appreciation, compliments
 - d. giving credit where due
 - e. listening to suggestions
 - f. giving positive performance feedback
 - g. increasing job challenge
 - h. delegating responsibility & authority
 - i. letting subordinates determine how to do their own work
 - j. sticking up for the group to superiors and others, backing a subordinate
9. **DISCIPLINING/PUNISHING**
 - a. enforcing rules and policies
 - b. nonverbal glaring, harassment
 - c. demotion, firing, layoff
 - d. any formal organizational reprimand or notice
 - e. "chewing out" a subordinate, criticizing
 - f. giving negative performance feedback
10. **INTERACTING WITH OUTSIDERS**
 - a. public relations
 - b. customers
 - c. contacts with suppliers, vendors
 - d. external meetings
 - e. community service activities
11. **MANAGING CONFLICT**
 - a. managing interpersonal conflict between subordinates or others
 - b. appealing to higher authority to resolve a dispute
 - c. appealing to 3rd party negotiators
 - d. trying to get cooperation or consensus between conflicting parties
 - e. attempting to resolve conflicts between subordinate and self
12. **SOCIALIZING/POLITICKING**
 - a. nonwork related chit chat (e.g., family or personal matters)
 - b. informal "joking around," B.S.
 - c. discussing rumors, hearsay, grapevine
 - d. complaining, griping, putting others down
 - e. politicking, gamesmanship

Figure 2
Collapsing of Behavioral Categories for Each Method into
Consideration and Initiation of Structure

MBS

Initiation of Structure

Coordinating
Planning
Problem Solving
Role Clarification
Goal Setting
Training

Consideration

Autonomy/Delegation
Consideration
Facilitating Subordinate Work
Criticism/Discipline
Conflict Management
Facilitating Group Interaction

LBDQ-XII

Initiation of Structure

Integration
Production Emphasis
Representation
Superior Orientation
Initiation of Structure

Consideration

Consideration
Tolerance of Freedom
Tolerance of Uncertainty

LOS

Initiation of Structure

Planning/Coordinating
Decision-Making/Problem
Solving
Monitorial/Controlling
Performance
Staffing
Exchanging Routine
Information
Training

Consideration

Motivating/Reinforcing
Disciplining/Punishing
Managing Conflict
Socializing/Politicking

Table 1A
Components and Indices for the LBDQ-XII MTMM Using Multiraters
(Self, Superior, Subordinate and Peer)

Source*	Variance Components	Indices**
L (convergent validity)	.168	.19
L x B (discriminant validity)	.009	.01
L x S (halo)	.176	.20
Error	.708	

*L = Target Leader
B = Behavior
S = Source or Rater

**Variance components standardized
error term

Table 1B
Components and Indices for the MBS MTMM Using Multiraters
(Self, Superior, Subordinate and Peer)

Source	Variance Components	Indices
L (convergent validity)	.167	.21
L x B (discriminant validity)	.009	.01
L x S (halo)	.256	.29
Error	.632	

Table 1C
Components and Indices for the LOS MTMM Using Multiraters
(Participant and Outside Observers)

Source	Variance Components	Indices
L (convergent validity)	.196	.42
L x B (discriminant validity)	.584	.68
L x S (halo)	.003	.01
Error	.268	

Table 1D
Components and Indices for the Multiple Methods
of LBDQ-XII, MBS, and LOS

Source	Variance Components	Indices
L (convergent validity)	.381	.54
L x B (discriminant validity)	.038	.10
L x S (halo)	.407	.55
Error	.328	

Table 1E
Components and Indices for the LOS MTMM Using Multiple Methods
(Observations and Self Estimate Questionnaire)

Source	Variance Components	Indices
L (convergent validity)	.239	.31
L x B (discriminant validity)	.097	.15
L x S (halo)	.265	.33
Error	.540	

Table 2
LOS Multirater Matrix
(Participant and Outside Observers)

The figures enclosed in parentheses are the validity diagonals; the figures enclosed within solid triangles are the monomethod-heterobehavior blocks; and the figures enclosed within dotted triangles are the heteromethod-heterobehavior blocks.)

		PARTICIPANT OBSERVER											
		P ₁	P ₂	P ₃	P ₄	P ₅	P ₆	P ₇	P ₈	P ₉	P ₁₀	P ₁₁	P ₁₂
PARTICIPANT OBSERVER													
PLANNING/COORD.	P ₁	1.0	.11*	.06	.48*	.18*	.18*	.35*	.54*	.10*	.17*	.07	.31*
STAFFING	P ₂		1.0	.08	.01	.14*	.02	.02	.07	.02	.01	.04	.01
TRAINING	P ₃			1.0	.06	.16*	.07	.02	.03	.07	.03	.01	.10*
DEC. MAKING/PROB.-SOL.	P ₄				1.0	.4*	.21*	.32*	.48*	.10*	.06	.10*	.26*
PROCESSING PAPERWORK	P ₅					1.0	.06	.04	.13*	.03	.04	.02	.15*
EXCHANGING ROUTINE INFO.	P ₆						1.0	.1*	.19*	.06	.02	.02	.25*
MONITORING/CONTROL PERF.	P ₇							1.0	.38*	.06	.24*	.03	.30*
MOTIVATING/REINFORCING	P ₈								1.0	.01	.15*	.11*	.44*
DISCIPLINING/PUNISH	P ₉									1.0	.05	.02	.10*
INTERACT. W/OUTSIDERS	P ₁₀										1.0	.04	.09
MANAGING CONFLICT	P ₁₁											1.0	.06
SOCIALIZING/POLITICING	P ₁₂												1.0
OUTSIDE OBSERVERS													
PLANNING/COORD.	O ₁												
STAFFING	O ₂												
TRAINING	O ₃												
DEC. MAKING/PROB.-SOL.	O ₄												
PROCESSING PAPERWORK	O ₅												
EXCHANGING ROUTINE INFO.	O ₆												
MONITORING/CONTROL PERF.	O ₇												
MOTIVATING/REINFORCING	O ₈												
DISCIPLINING/PUNISH	O ₉												
INTERACT. W/OUTSIDERS	O ₁₀												
MANAGING CONFLICT	O ₁₁												
SOCIALIZING/POLITICING	O ₁₂												

		OUTSIDE OBSERVERS											
		O ₁	O ₂	O ₃	O ₄	O ₅	O ₆	O ₇	O ₈	O ₉	O ₁₀	O ₁₁	O ₁₂
		.36*	.16*	.09	.11*	.32*	.19*	.46*	.60*	.06	.25*	.05	.30*
		.11*	(.81)	.48	.00	.09	.04	.04	.08	.01	.03	.03	.04
		.06	.04	(.62)	.45	.19*	.07	.07	.05	.02	.04	.04	.09
		.43*	.02	.1*	(.84)	.40*	.19*	.38*	.52*	.06	.15*	.05	.25*
		.15*	.14*	.1*	.31*	(.71)	.06	.05	.18*	.06	.02	.06	.17*
		.19*	.01	.07	.24*	.11*	(.70)	.25*	.24*	.03	.01	.05	.22*
		.36*	.03	.05	.33*	.19*	.11*	(.71)	.47*	.04	.24*	.07	.30*
		.55*	.13*	.14*	.48*	.37*	.26*	.54*	(.83)	.63	.22*	.07	.43*
		.10*	.02	.03	.10*	.08	.05	.06	.08*	(.38)	.05	.01	.10*
		.19*	.02	.03	.04	.02	.05	.23*	.19	.03	(.77)	.61	.08
		.07	.04	.05	.05	.11*	.04	.06	.10*	.01	.09	(.49)	.07
		.26*	.02	.07	.28*	.27*	.21*	.43*	.48*	.06	.06	.00	(.80)
		1.0	.16*	.13*	.44*	.30*	.20*	.47*	.60*	.06	.28*	.05	.27*
			1.0	.08	.02	.07	.00	.09	.14*	.01	.06	.03	.01
				1.0	.15*	.12*	.04	.14*	.12*	.02	.01	.03	.07
					1.0	.49*	.22*	.40*	.56*	.06	.14*	.11*	.23*
						1.0	.15*	.29*	.44*	.05	.04	.04	.33*
							1.0	.23*	.26*	.03	.01	.08	.21*
								1.0	.62*	.04	.28*	.09	.42*
									1.0	.04	.27*	.07	.48*
										1.0	.03	.01	.06
											1.0	.01	.03
												1.0	.05
													1.0

Note: This analysis includes the observed behaviors for which the participant and outside observers simultaneously, but independently, filled out the LOS.

*p < .05

Table 3
Multimethod Matrix for LBDQ, MBS, and LOS

	LOS		LBDQ-XII		MBS	
	IS	C	IS	C	IS	C
LOS						
IS	1.0	.67*	(.08)	.01	(.09)	.14
C		1.0	.10	(.07)	.10	(.19)*
LBDQ-XII						
IS			1.0	.41*	(.59)*	.40*
C				1.0	.61*	(.57)*
MBS						
IS					1.0	.82*
C						1.0

* $p < .05$

Table 4
Multimethod Matrix:
LOS and Self Estimate of Time Usage Questionnaire

(The figures enclosed in parentheses are the validity diagonals; the figures enclosed within solid triangles are the nomomethod-heterobehavior blocks; and the figures enclosed within dotted triangles are the heteromethod-heterobehavior blocks.)

OBSERVATION	Observation Method											
	DM	DP	ER	IO	MC	MCP	MR	PC	PP	SP	ST	TD
Decision Making/Prob. Solv.	1.0	.56*	.73*	.46*	.53*	.64*	.67.	.73*	.51*	.55*	.55*	.53
Disciplining/Punishing		1.0	.55*	.52*	.65*	.63*	.69	.57*	.47*	.55*	.59*	.50*
Exchanging Routine Info.			1.0	.57*	.50*	.60*	.61	.64*	.75*	.71*	.58*	.58*
Interacting w/Outsiders				1.0	.40*	.37*	.52	.44*	.49*	.62*	.40*	.45*
Managing Conflict					1.0	.54*	.58*	.44*	.39*	.44*	.55*	.43*
Monitoring Performance						1.0	.67*	.65*	.50*	.55*	.61*	.53*
Motivating/Reinforcing							1.0	.69*	.52*	.61*	.45*	.50*
Planning/Coordinating								1.0	.48*	.50*	.56*	.65*
Processing Paperwork									1.0	.64*	.41*	.47*
Socializing/Politicking										1.0	.53*	.43*
Staffing											1.0	.54*
Training/Developing												1.0

SELF ESTIMATES

Decision Making/Prob. Sol.
disciplining/Punishing
Exchanging Routine Info.
Interacting w/Outsiders
Managing Conflict
Monitoring Performance
Motivating/Reinforcing
Planning/Coordinating
Processing Paperwork
Socializing/Politicking
Staffing
Training/Developing

Questionnaire Self Estimate Method												
DM	DP	ER	IO	MC	MCP	MR	PC	PP	SP	ST	TD	
(.08)	.13	.32	.35	.33	.33	.33	.13	.23*	.32	.14	.35	
.13	(.33)	.31	.35	.20*	.07	.03	.10	.02	.04	.21*	.13*	
.04	.05	(.32)	.17	.34	.34	.39	.01	.23*	.35	.08	.10	
.03	.10	.06	(.43)*	.22	.07	.35	.32	.14	.27*	.17	.09	
.12	.05	.01	.03	(.17)	.06	.16	.11	.38	.05	.13	.06	
.16	.31	.15	.07	.22*	(.17)	.16	.15	.07	.03	.20*	.15	
.07	.12	.06	.02	.16	.12	(.15)	.04	.35	.35	.38	.02	
.02	.14	.13	.06	.07	.19*	.08	(.17)	.22*	.17	.18*	.11	
.03	.13	.11	.31*	.08	.33	.23*	.15	(.30)*	.22*	.15	.23*	
.07	.10	.04	.04	.11	.09	.17	.03	.17	(.13)	.04	.07	
.07	.17	.13		.21*	.13	.03	.12	.07	.03	(.23)	.27*	
.04	.01	.36	.34	.05	.13	.38	.34	.34	.15	.15	(.32)	
1.0	.15	.01	.02	.28*	.14	.06	.19*	.02	.14	.27*	.03	
	1.0	.12	.12	.38*	.34*	.30*	.27*	.01	.28*	.52*	.44*	
		1.0	.01	.04	.21*	.13	.05	.16	.28*	.10	.11	
			1.0	.15	.32	.33	.34	.39*	.19*	.14	.02	
				1.0	.25*	.25*	.21*	.01	.18	.45*	.30*	
					1.0	.35*	.23*	.35	.08	.39*	.39*	
						1.0	.16	.01	.00	.31*	.22*	
							1.0	.15	.01	.23*	.25*	
								1.0	.17	.02	.01	
									1.0	.11*	.03	
										1.0	.45*	
											1.0	

*p < .05

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